Abstract

[An improved electrochemical cell such as a] A fuel cell [is disclosed including a porous support plate for enhancing transport of fluids throughout the cell and for enhancing capacitance and transient response capability of the cell. The electrochemical cell] includes an electrolyte having [opposed major surfaces with an] anode and [a] cathode electrodes [supported in intimate] contacting [with the] opposed [major] surfaces of the electrolyte. A porous support plate is secured adjacent each electrode, [and] each [porous support plate] includ[es]ing a contact bi-layer in intimate contact [with the electrode. Each contact bi-layer is] therewith and comprised of a hydrophobic phase including a mixture of carbon black and a hydrophobic polymer defining a network of hydrophobic gas passages, [and] each [contact bi-layer] also [includes] comprised of a hydrophilic phase including a mixture of carbon black and a proton exchange resin defining a network of hydrophilic liquid passages [integrated throughout the contact bi-layer]. Each porous support plate also includes a porous substrate layer adjacent and supporting the contact bi-layer. A method of manufacture [of the porous support plate] includes [the steps of] preparing [a] hydrophobic phase [compound, preparing a] and hydrophilic phase compounds, mixing and filtering the [two] compounds to form a contact bi-layer, and transferring the [contact] bi-layer onto a porous substrate layer to form a porous support plate. An alternative method includes [an additional step of] activating the [contact] bi-layer in an acid bath at controlled [electrical potentials to enhance capacitance of the cell] voltage.